

What is claimed is:

1           1. A III group nitride system compound semiconductor  
2 light emitting element, comprising:

3           a transparent substrate with a concave portion on the  
4 surface, the transparent substrate being of a material except  
5 for III group nitride system compound semiconductor;

6           a filling material that is embedded in the concave  
7 portion; and

8           a III group nitride system compound semiconductor layer  
9 that is formed on the surface of the transparent substrate;

10          wherein the filling material has a refractive index  
11 substantially equal to that of the III group nitride system  
12 compound semiconductor layer or closer to that of the III group  
13 nitride system compound semiconductor layer than that of the  
14 transparent substrate.

1           2. The III group nitride system compound semiconductor  
2 light emitting element according to claim 1, wherein:

3           the filling material is embedded in the concave portion  
4 such that the surface of the embedded filling material is at  
5 a level substantially equal to the top surface of the  
6 transparent substrate.

1           3. The III group nitride system compound semiconductor  
2 light emitting element according to claim 1, wherein:

3           the transparent substrate is of sapphire and the filling  
4 material is at least one selected from the group of  $\text{CeO}_2$ ,  $\text{TiO}_2$ ,  
5  $\text{Nd}_2\text{O}_3$ ,  $\text{Ta}_2\text{O}_5$ ,  $\text{ZrO}_2$  and III group nitride system compound

6 semiconductor.

1 4. A method of making a III group nitride system compound  
2 semiconductor light emitting element, comprising the steps of:  
3 providing a transparent substrate with a concave portion  
4 on the surface;

5 embedding a filling material in the concave portion;  
6 forming a buffer layer on the surface of the transparent  
7 substrate; and

8 forming a III group nitride system compound semiconductor  
9 layer on the buffer layer;

10 wherein the filling material has a refractive index  
11 substantially equal to that of the III group nitride system  
12 compound semiconductor layer or closer to that of the III group  
13 nitride system compound semiconductor layer than that of the  
14 transparent substrate.

1 5. The method of making a III group nitride system compound  
2 semiconductor light emitting element according to claim 4,  
3 wherein:

4 the embedding step of the filling material is conducted  
5 such that the surface of the embedded filling material is at  
6 a level substantially equal to the top surface of the  
7 transparent substrate.

1 6. A method of treating the surface of a transparent  
2 substrate, comprising the steps of:

3 forming a concave portion on the surface of the  
4 transparent substrate; and

5           embedding a filling material in the concave portion;  
6           wherein the filling material has a refractive index  
7           substantially equal to that of the III group nitride system  
8           compound semiconductor layer or closer to that of the III group  
9           nitride system compound semiconductor layer than that of the  
10          transparent substrate.

1           7. A pretreated transparent substrate, comprising:  
2           a transparent substrate with a concave portion on the  
3           surface, the transparent substrate being of a material except  
4           for III group nitride system compound semiconductor; and  
5           a filling material that is embedded in the concave  
6           portion;  
7           wherein the filling material has a refractive index  
8           substantially equal to that of the III group nitride system  
9           compound semiconductor layer or closer to that of the III group  
10          nitride system compound semiconductor layer than that of the  
11          transparent substrate.